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This paper presents the findings of a study designed to identify the user library catalog interface style preferences of undergraduate students and to attempt to identify factors that contribute to these preferences. Twelve participants from the University of North Carolina at Chapel Hill used two different OPAC interface styles (graphical and command line) to complete ten tasks and an exit questionnaire. The results of the study suggest that undergraduate students prefer the graphical user interface style. The study was performed with a small sample of convenience and should be considered as exploratory in nature.

Headings:

Online catalogs

Graphical user interfaces

College and university libraries / services to undergraduate students

GRAPHICAL VS. COMMAND USER INTERFACE: AN EXPLORATORY STUDY
OF UNDERGRADUATE STUDENTS' OPAC INTERFACE PREFERENCES.

by
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Approved by

Diane Kelly

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Introduction

User interfaces (UI) are portals through which humans are able to interact with computers. They began as command line interfaces (CUI) where users would use text-based commands and menus to facilitate interactions, but they have since evolved with computer technology. The latest UIs exchanged their text commands for icon or other visual representations of commands. Graphical user interfaces (GUI) first appeared in the early 1990s and have become the dominant user interface available for most software and operating systems. One of the reasons for GUI's popularity is that the interface appeals to humans' innate pointing behavior, which is typically employed during infancy as one of the first methods of communication (Bakeman & Adamson, 1986).

GUIs appeared in their first modern incarnation in the Macintosh computer unveiled in 1983. The interface style did not become common until the home computer revolution of the mid-1990s. Despite its prevalence, there may be cause to question the rapid adoption of the GUI interface and reexamine the CUI.

Computers have been embraced by society and saturate many levels of users' daily lives. Researchers are in a unique position to begin performing studies on a population that is firmly acquainted with computer interactions. This population contains a large portion of users who are completely net-native and have essentially grown up using computers. This is a stark contrast from the times when many of the initial user interface preference studies were conducted. The populations examined in

those early studies often had little computer experience especially when compared to contemporary users.

Past research reveals that participants have typically expressed a preference for GUIs based on their positive perceptions of the following dimensions: ease of use, usefulness, satisfaction with search results, and aesthetics. Davis defines ease of use as an estimation of how little effort a user will have to exert to use a system. He defines usefulness as the extent to which users believe a system will enable them to complete a task (Davis 1989). Search satisfaction is defined as the degree of users' belief that they have retrieved results that successfully answers their information need. Aesthetics is a property that is loosely defined as visual beauty (Tractinsky 1997).

A visit to most libraries will reveal that these institutions have wholly embraced GUIs as their interface of choice for online public access catalogs (OPAC). For libraries to participate in a nearly universal shift away from CUI interfaces there exists surprisingly little research on modern computer users' satisfaction with GUI OPACs. Net-natives did not exist when past research was conducted and such users have likely never encountered a CUI interface. In adding, many current users have experience using text based interfaces to send text message and perform other simple communication tasks. The lack of research on current users' satisfaction with modern web-based OPACs represents a sizable gap in the literature. This study's goal is to determine whether users' interface preferences have changed from those previously recorded. Do the majority of users still prefer using GUI interfaces?

Literature Review

The following studies are concerned with end users' perceptions of GUI and CUI systems and how such perceptions shape users' preferences for OPAC UI style. The studies identify the dimensions of ease-of-use, system performance, users' search satisfaction and aesthetics as factors that influence users' preferences. These dimensions are completely subjective and stem from users' perceptions of the interface's properties. It is important to note when reviewing these studies that GUIs were the newer of the two interfaces and the GUI was the preferred choice for many entry-level users in the 1990's when these studies were conducted. The newness of the interface type may have primed users to believe that GUIs are inherently more advanced and thus better than CUIs which could have predisposed users to prefer the GUIs. The following literature examines studies that shed light on the effects of aesthetics on users' perceptions of UIs.

Aesthetics

A basic visual comparison of GUI and CUI interfaces will reveal an obvious difference. GUIs tend to utilize multiple colors and pictures and are generally more pleasing to look at than monochromatic CUIs. This aesthetic difference may be a large factor in determining whether users perceive an interface style a useful or user-friendly. Some research on the role of aesthetics in human computer interaction has determined that people tend to think more positively about interfaces that are visually pleasing.

Kurosu and Kashimura (1995) performed a study that found that users are influenced by interfaces' aesthetic properties. Users generally perceived beautiful interfaces as easier to use/more functional than less aesthetically pleasing alternatives.

To obtain these findings, the researchers asked a group of twenty-six professionals, designers, and engineers to create layouts based on selected interface components from the input screen of an automated teller machine. A total of twenty-six interfaces were then analyzed by the researchers and assigned usability and aesthetic values. Two-hundred and fifty-two students in university level design and psychology courses were then asked to rate the usability and attractiveness of each layout. A strong relationship was discovered between attractiveness and usability.

Tractinsky, Shoval-Katz and Ikar (2000) completed a similar study. Nine layouts were selected and adapted from the Kurosu's (1995) original twenty-six layouts and evaluated by one-hundred and thirty-two industrial engineering students. Participants were asked to rate layouts based on one of three factors: aesthetic, ease of use and amount of information on the screen. The interfaces were then organized into groups based on their aesthetic score. The participants were divided into groups and asked to perform a number of tasks using the interfaces. The participants were then asked to rate their interface before and after use. The researchers' results confirmed earlier research and noted that there was a strong relationship between aesthetics and usability perception. The researchers also noted that users of the low and medium aesthetic interfaces had improved post-task perceptions of their interfaces. This suggests that user familiarity and exposure to a certain interface may increase positive perception. This familiarity bias may have played a factor in user acceptance of GUI interfaces in previously mentioned studies.

These studies highlighted the fact that visual components may be a predictor of users' interface preferences. More investigation into the role of user perceptions of

usability and aesthetics/beauty needs to occur. The idea that beauty affects humans' judgments is not new. The beauty-bias as known in the realm of psychology is a cognitive bias that can be generalized as the phenomenon where people generally believe attractive people are superior simply based on looks (Dion, Bercheid, Walster 1972). When considered with an interdisciplinary mindset, interfaces considered to be beautiful may also benefit from the same beauty-bias as humans, especially when beauty is a differing factor between competing options.

System Performance

Aesthetics may be a factor in users interface preferences, but it is far from being the only influence on users' interface preferences. Rathburg (1992) compares user performance with CUI and GUI based interfaces. Rathburg gathered twenty-four participants, twelve expert and twelve novice computer users. The participants were split into four groups of six, with novice and expert groups for each UI style. They were asked to perform ten tasks on relational database management software. The users task completion times and keystrokes were evaluated. The GUI users completed their first six tasks quicker than the CUI users and needed 38% less time to complete their tasks than CUI users. It was found that experts using the GUI only took around half the time taken by CUI users to complete the tasks and that the groups' averaged task completion times show that the GUI users outperformed the CUI users.

D'ydewalle, Leemans, and Van Rensbergen (1995) also wanted to test the effects of GUI and CUI interfaces on user task performance. Thirty participants were divided into three groups, one using the command-line interface and the other two utilizing GUI interfaces. The participants were required to edit one of two text files

using a cross-platform word processing program while being timed. The study concluded that there was no significant difference between the groups concerning the time needed to complete the tasks. This study contradicts Rathburg's (1992) findings concerning task completion time and interface style.

The samples in these system performance studies consisted of both novice and experienced computer users. Novice users could be thought of as casual computer users. Experienced users are users who have a high frequency of computer use. Borgman (1986) noted that a user's frequency of computer use and the amount of time spent using a computer system can affect the user's performance. It is reasonable to perceive most of today's computer users as experienced, when one considers that even grocery-store check-out registers require users to navigate a touch-screen GUI interface in order to purchase food.

OPAC Specific Research

Hildreth (2001) hypothesized that users would believe that a GUI OPAC would be superior in performance to a CUI OPAC and that users would prefer using the GUI to the CUI. The participants in this study were undergraduate students at the University of Oklahoma. The participants, a self-selected sample of convenience, were divided into four groups and given tasks to perform on each OPAC. The groups were required to complete tasks of differing difficulty. The results of the study indicated that all the groups had the same satisfaction level with their search results regardless of the OPAC type used. Users did however, report that the GUI was easier to use. Users who had experience executing web searches reported that they were highly likely to use the GUI OPAC in the future. The preference of users who had web experience selecting the GUI

for future use may be significant, because it could reveal an exposure bias which could mean that users simply prefer what they consider familiar. The fact that both groups were satisfied with their search results may imply that users are pleased with any results rather than useful results or no results. A strong correlation was discovered between ease-of-use and perceived usefulness.

Medeiros, Beattie and Wu (1999) were concerned with the absence of research that directly compared user satisfaction between GUI and CUI OPACs. They pointed out that users have been “force fed” GUI OPAC systems meaning that command-line terminals have been quickly replaced with their graphical counterparts without taking into consideration possible user preferences. The researchers took advantage of the introduction of a new web-based OPAC at the Ehrman Medical Library at the New York School of Medicine. The participants were faculty members and MD/Ph.D. students. The authors utilized a questionnaire, search statistics, and anecdotal accounts of search behavior in their data collection. Their results revealed that 53% of all users accessed the library’s catalog via the GUI exclusively, while 14% used the CUI version. The remaining 33% reported that they utilized both interfaces. 72% of users expressed an explicit preference for the GUI, while 24% of users stated that they preferred the CUI. Despite being preferred by only a fourth of those surveyed, the CUI was logged as having been used for 29% of searches. Users of the CUI reported that they felt that the CUI was faster than the GUI.

Marshall and Zorn (1995 & 1997) performed two studies on the acceptance of GUI interfaces by the user population at the Parkes Davis Pharmaceutical Research Library. The studies occurred within less than five years of each other and reported that

users consistently showed a preference for GUI interfaces. In 1995 they examined users' reactions to an OPAC migration from a CUI to a GUI. They surveyed library users who had experience with both interfaces. The survey revealed that 89% of users were extremely satisfied with the GUI system, while 66% were extremely satisfied with the CUI system. Users were then asked to answer judgment questions designed to reveal clear preferences for one system or the other. 68% thought that the GUI system was faster, 80% agreed that it was easier to navigate, and 84% thought the GUI system was more user-friendly than the CUI system. In the end, 75% agreed that they preferred the GUI system to the CUI system.

In 1997, Marshall and Zorn performed a second iteration of the experiment in the same library using comparable methodology. They obtained similar results. 55% of the respondents perceived that the GUI was faster, 61% thought that it was more user-friendly, and 89% of respondents preferred the GUI. It is interesting that there was a 12% decline in the number of users who perceived the GUI as faster, and a 23% drop in user opinion of user-friendliness. The number of users who reported a strong preference for the GUI increased by 11%. Once again ease of use and user friendliness seemed to govern user preference.

These studies are unique, because they attempt to establish a semi-longitudinal precedent concerning users' preference for GUI interfaces. Could the increase in user preference for the GUI OPAC be a result of the past GUI migration that primed/familiarized the sample with the GUI?

Beheshti, Jamshid, Large, and Bialek (1996) piloted the Public Access Catalog Extension (PACE) project in 1994. They tested a software extension that operated as a

GUI enhancement of an existing CUI OPAC. The interface was designed to assist users engaging in browsing. The researchers were concerned with PACE's performance in four areas: users' interaction time, system speed, search success, and ease of use. The participants in the study were a selection of convenience of one hundred and eighteen students at Vanier College. The students were randomly assigned to use either the GUI interface or the CUI interface. To obtain their data, the researchers employed two structured interviews with subjects. A pre-usage interview was used to assess computer and library familiarity and demographic information. A post-test interview was conducted to gather user comments and evaluations of the systems used. Within the first three minutes of system usage, 13% more CUI users than GUI users were able to find interesting resources. After five minutes, however, users in both groups had typically located their first resource. Researchers noted that the CUI interface had a richer array of navigation choices when compared to the prototype GUI, which could explain the CUI users' slight advantage in search speed. Participants' success rates in locating items were similar. 81% of participants who had used the GUI and were now acquainted with both interfaces preferred the GUI. The researchers asked participants an open-ended question about the GUI, and the students unanimously mentioned that they liked the visual presentation of the interface, specifically the graphics and colors. This finding suggests that attractiveness or beauty may be something that helps determine user preference.

Tomaiuolo (1996) performed a study on a sample of convenience of public library patrons at five public library locations. In this study, Tomaiuolo specifically recognized the fact that professional and academic settings where previous studies had

taken place sampled populations with above average technological skills and did not necessarily represent public library clientele. His study was designed to determine whether library patrons found an experimental GUI OPAC easier to use than the existing CUI OPAC. He wanted to ascertain whether providing instructional assistance for users would influence their interface preference. The researcher would randomly choose the level of instructional assistance that they would provide each subject. The levels of help ranged from cursory help, the researcher giving a brief overview of the system and pointing out the help icon, to the researcher demonstrating examples of popular searches, to unlimited assistance. The users, benefitting from whatever level of help they were assigned, were asked to execute a search for ten minutes. After the search session was completed, the users were asked to fill out a short questionnaire. The results of the questionnaires were analyzed and seem to mirror results found in previous studies. Of the 55% of users that felt that they were able to make a decision of preference, 83% preferred the GUI, and 9% preferred the CUI. Over the course of the study, Tomaiuolo noted that users frequently commented on the GUI system's ease-of-use.

To effectively research an area, a comprehensive understanding of the subject being examined must be obtained. The literature reviewed was selected and analyzed due the correlations that could be drawn between the research and the proposed research. OPAC interface preferences seem to be correlated with the dimensions of ease-of-use, system performance, and aesthetics. System performance was often considered a factor in users' perceptions of usability. The factors that influence user preference are not clearly confined to the realm of library science and an

interdisciplinary approach needs to be considered when attempting research on the subject.

Both GUIs and CUIs have their own strengths and weaknesses; however as Hildreth (1995) points out that system architects are entrenched in the ideal that users prefer and need GUIs. He suggests that users will benefit more from a sound knowledge of how search processes take place than from overly simplified cosmetically updated systems. System designers, he argues, should provide an interface that allows the user to participate in the information seeking process in an informed manner. The change from CUI OPACs to GUI OPACs may have occurred with little examination of user preferences, but is far from irreversible. It is important to provide users with interfaces that they can effectively use and understand regardless of the popularity of one interface over another.

Methodology

Participants

The sample consisted of twelve undergraduate students. They were largely a selection of convenience and not randomly selected. They were recruited via a single mass-email, flyers posted in buildings across the UNC-CH campus including the R.B. House Undergraduate library, and by word of mouth. The inclusion criteria was that the participants were students at UNC-CH, that they had an undergraduate status, were at least eighteen years of age, and were not visually impaired. The sample size was chosen because it facilitated for the execution of a counter-balanced study. The incentive to participate in the study was a one-in-twelve chance to win a twenty-five dollar gift card to the i-Tunes online store. The only cost to the participants was their time.

Procedures and Instruments

When a participant arrived for their meeting with the researcher, they were given a fact sheet detailing the specifics of the study. After they agreed to continue with the study, they were presented with an OPAC and a list of tasks to complete.

Two differing OPACs from the library at Appalachian State University were chosen for use in this study. The illustrations have been provided below to provide examples of the execution of a search on both OPAC systems. The GUI is graphically intensive and is controlled via the mouse and keyboard. The CUI system is monochrome and navigated with keyboard commands.

The following screen shots illustrate the completion of a search task as performed on both the GUI and CUI. A screen shot of the GUI OPAC's main search page is shown below in Figure 1. To execute a search for items by author Stephen King,

a user must select the Books and Media tab, select Author from the drop down box, type the author's name in the search box, and then click search as seen in Figure 1. The user then selects the author's name as seen in Figure 2.

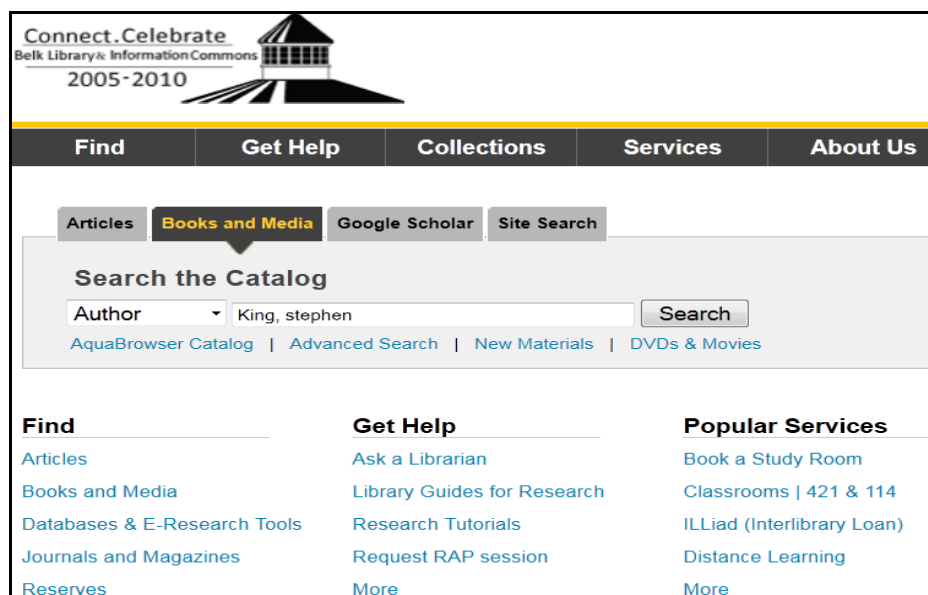


Figure 1: GUI OPAC's Main search screen

Num		Save	AUTHORS (1-14 of 14)	
1	<input type="checkbox"/>		King Stephen : WEB ACCESS	
2	<input type="checkbox"/>		King Stephen 1931 : WCU WEB ACCESS	
3			<p>Works by this author are entered under the name used in the item or other names used by this author, search also under King, Stephen</p> <p>-- See Also Bachman, Richard</p>	
4	<input type="checkbox"/>		King Stephen 1947	
5	<input type="checkbox"/>		King Stephen A 1964	
6	<input type="checkbox"/>		King Stephen B	
7	<input type="checkbox"/>		King Stephen Clark	
8	<input type="checkbox"/>		King Stephen D	

Figure 2: GUI OPAC's Author search results screen

The screen shot in Figure 3 is of the CUI OPAC's main search screen. To execute a search for items by author Stephen King, a user must press the 'A' key to select an author search. The user must then type in the author's name and press the enter key as seen in Figure 4.

```

                                Western North Carolina Library Network
                                Appalachian State Univ., UNC Asheville, Western Carolina Univ.

                                TYPE the LETTER of your choice:
                                A > AUTHOR
                                T > TITLE
                                D > AUTHOR/TITLE SEARCH
                                K > KEYWORD (Words in Title, Subject, Notes)
                                S > SUBJECT (Library of Congress Headings)
                                P > PERIODICAL TITLE
                                C > CALL NUMBER
                                Y > Repeat PREVIOUS Search
                                R > RESERVE LISTS
                                I > LIBRARY INFORMATION
                                V > VIEW your circulation record
                                X > SEARCH Other Locations
                                Q > QUIT

                                Choose one (A,T,D,K,S,P,C,Y,R,I,V,X,Q) █

```

Figure 3: CUI OPAC's Main search screen

```

                                AUTHOR : █

                                Type in the name of a person or an organization.

                                1) Person: type LAST NAME first

                                For example ---> Evans-Pritchard, E. E.

                                or ---> Evans-Pritch

                                2) Organizations

                                For example ---> Smithsonian Institution

                                or ---> North Carolina Institute of Government

                                [Press <F11> or <ESC> to begin a different search.]

                                .... then press the RETURN key

```

Figure 4: CUI OPAC's Author search screen

In the GUI catalog, once the user selects an author's name from the list, a list of that author's works is presented, as seen in Figure 5. From this screen the user can click on individual titles to view the item's catalog record.



Figure 5: GUI OPAC's Results screen

In the CUI, once a user enters an author's name in the author search they are shown a list of possible matches to their query which are numbered for selection. To select an author, the user must type in the author's corresponding number, as seen in Figure 6.

```

You searched for the AUTHOR: king stephen
14 AUTHORS found, with 114 entries; AUTHORS 1-8 are:

  1 King Stephen ..... 1 entry
  2 King Stephen 1931 ..... 1 entry
  3 King Stephen 1947 --> See also BACHMAN, RICHARD ..... 1 entry
  4 King Stephen 1947 ..... 93 entries
  5 King Stephen A 1964 ..... 2 entries
  6 King Stephen B ..... 2 entries
  7 King Stephen Clark ..... 2 entries
  8 King Stephen D ..... 2 entries

Please type the NUMBER of the item you want to see, OR
F > Go FORWARD          P > PRINT
N > NEW Search           D > DISPLAY Title and Locations
A > ANOTHER Search by AUTHOR  + > ADDITIONAL options
Choose one (1-8,F,N,A,P,D,L,J,Y,X,+) █

```

Figure 6: CUI OPAC's Author search results screen

After selecting the author's number from the list, participants are presented with a list of the author's works, as seen in Figure 7. Participants can then select the row they would like to view.

```

You searched for the AUTHOR: king stephen
93 entries found, entries 1-8 are:
King Stephen 1947
  1 The Bachman books : four early novels      ASU
  2 Bag of bones                             ASU
  3 Blockade Billy                           WCU
  4 Body                                       WCU
  5 Carrie                                    ASU,
  6 Carrie                                    WCU
  7 Cell                                       ASU
  8 Cell : a novel                           , WCU

Please type the NUMBER of the item you want to see, OR
F > Go FORWARD          A > ANOTHER Search by AUTHOR
R > RETURN to Browsing   P > PRINT
N > NEW Search           + > ADDITIONAL options
Choose one (1-8,F,R,N,A,P,L,J,E,Y,X,+) █

```

Figure 7: CUI OPAC's Results screen

The OPACs access the same library collection but display the results in a different fashion. The GUI interface integrates the CUI's screens shown in Figure 3 and Figure 4

into one screen as seen in Figure 1. The GUI is navigated primarily by mouse, and provides more visual cues, whereas the CUI is navigated by the keyboard and is presented in monochrome.

Participants in this study were required to complete searches using both OPACs. They completed a task list with one OPAC and then completed the second task list with the other OPAC. Each task list contained five tasks consisting of both simple and complex searches as well as browsing tasks. The task lists can be found in Appendix A. The orders in which the task lists were completed and the order of the OPACs used were rotated to achieve a counterbalanced design. This design was implemented to remove the order of treatment, and the participant's subsequent learning of the treatments as a possible confound for results. The responses to the search tasks were not evaluated and the tasks lists were only intended to acquaint participants with each OPAC and to illicit an informed decision as to system preference.

After using both OPACs and completing the task lists, participants completed the exit questionnaire. The questionnaire was used to collect participants' overall OPAC preferences, demographic data and the participants' impressions of dimensions that might influence UI preference. It consisted of a series of Likert-scale questions concerning ease of use, usefulness, system performance, search satisfaction, aesthetics, and overall OPAC preference. These items were measured on a 4-point scale, where 1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree. A categorical breakdown of the questions can be seen in Figure 8.

<p style="text-align: center;">Overall OPAC Preference</p> <p>1. I would use the catalog again for future searches.</p> <p>2. Now that you've tested both user interface styles, which catalog do you prefer using?</p> <p style="text-align: center;">Ease of Use</p> <p>3. It was easy to get the catalog to do what I wanted it to do.</p> <p>4. The catalog provided clear navigation choices that allowed me to complete my searches.</p> <p>5. I believe that someone who is new to the library could use this catalog easily with little or no training.</p> <p>6. The catalog was helpful in assisting me to search effectively.</p> <p style="text-align: center;">System Performance</p> <p>7. I thought the catalog was fast.</p> <p style="text-align: center;">Satisfaction</p> <p>8. I was satisfied with my search experience.</p> <p style="text-align: center;">Aesthetics</p> <p>9. I believe that the catalog was visually pleasing.</p>
--

Figure 8: Questionnaire item categories (Not in original numerical order)

A number of items in the questionnaire were adapted from the questionnaire used by Hildreth's (2001) study. Additionally, participants were asked to share what they liked or disliked about their searching experience by answering an open ended question. The full exit questionnaire can be found in Appendix B.

When the participants had completed the exit questionnaire; they were thanked, debriefed, and informed of the time frame in which the inducement would be awarded. The interaction including the introduction, OPAC interactions, and debriefing took an average of thirty minutes, the shortest interaction taking only twenty-one minutes, and the longest nearly an hour.

Participants overall OPAC type preference was the primary dependent variable measured in this study.

The study was approved by UNC Chapel Hill's Behavioral Institutional Review Board and is study number 11-0379.

Results

Overall OPAC Preference

When the participants were asked for their overall OPAC preference, 9 or 75% of the participants preferred the GUI, while the remaining 3 or 25% of the participants preferred the CUI. A binomial test on the distribution of responses shows that there is a no difference in participants OPAC preference with a score of $p = .146$. The distribution of responses can be seen in Figure 9.

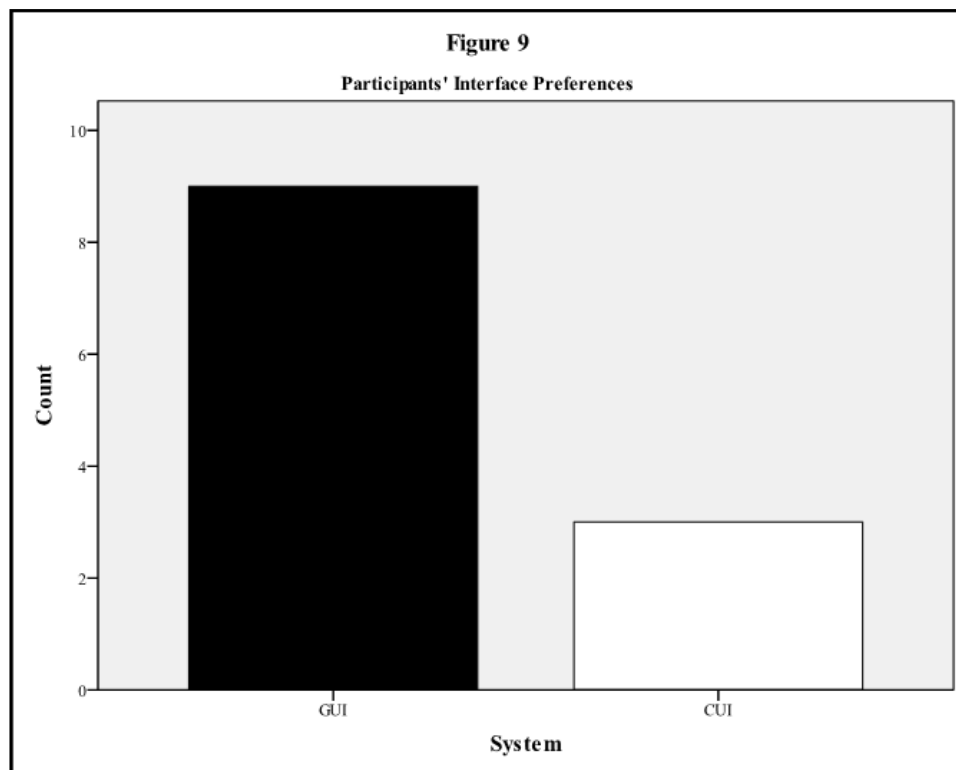


Figure 9: Participants' overall UI preference

When asked if they would use the GUI OPAC in the future, 2 or 17% strongly agreed, 7 or 58% disagreed, and 2 or 17% agreed, while 1 or 8% strongly disagreed. When asked if they would use the CUI OPAC in the future, 1 or 8% strongly agreed, 3 or 25% agreed, 4 or 33% disagreed and 4 or 33% strongly disagreed. Participants were equally divided concerning their willingness to use the GUI and CUI OPACs again; however, more participants strongly disagreed with their willingness to use the CUI again. This distribution can be seen in Figure 10.

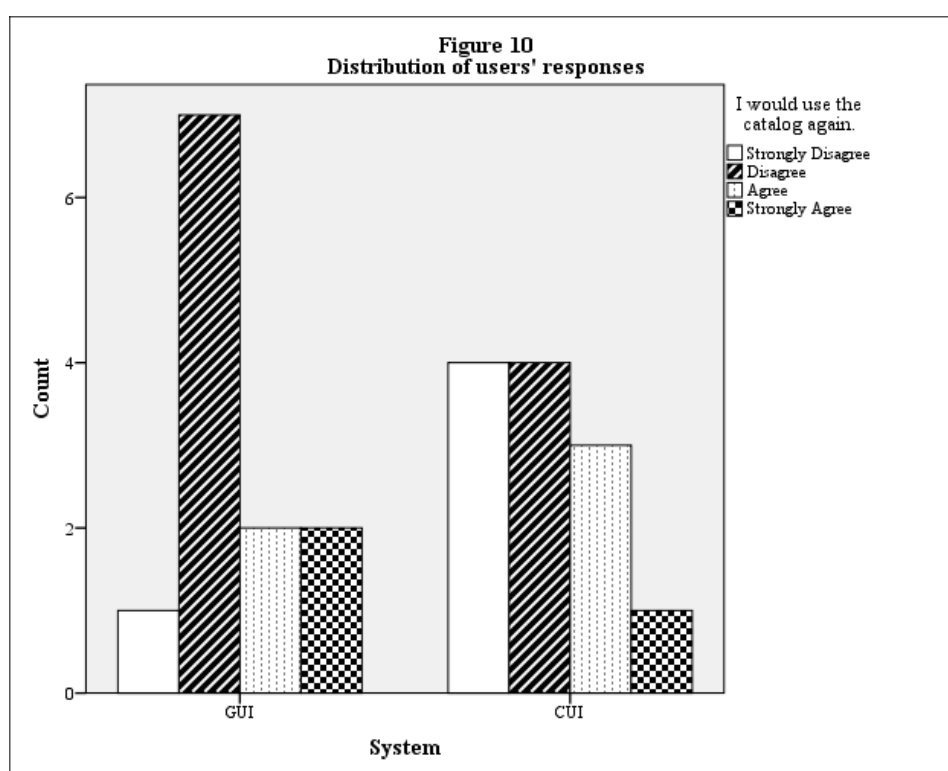


Figure 10: Participants' willingness to use the systems again

No significant difference was measured between participants' willingness to use a catalog again and the system that they utilized, $\chi^2 (3, N = 12) = 3.152, p = .369$. When examining the raw numbers, participants seem to be generally negative towards the idea of using either interface again but show a stronger dislike for the CUI interface than the GUI interface. However, responses to this question were likely a result of participants'

not needing to use either interface again; posing this question differently (e.g., asking participants to imagine that this was UNC's OPAC) may have changed the distribution of responses.

Ease of use

When asked if it was easy to get the GUI catalog to do what they wanted, 2 or 17% strongly agreed, 8 or 66% agreed, and 2 or 17% disagreed. When asked the same of the CUI, 2 or 17% strongly agreed, 6 or 50% agreed, 3 or 25% disagreed, and 1 or 8% strongly disagreed. To provide a better visualization of the data, participants' responses were tabulated and presented in Figure 11. Participants responded favorably to both UIs, however, 16% more participants thought that the GUI was easier to use than the CUI.

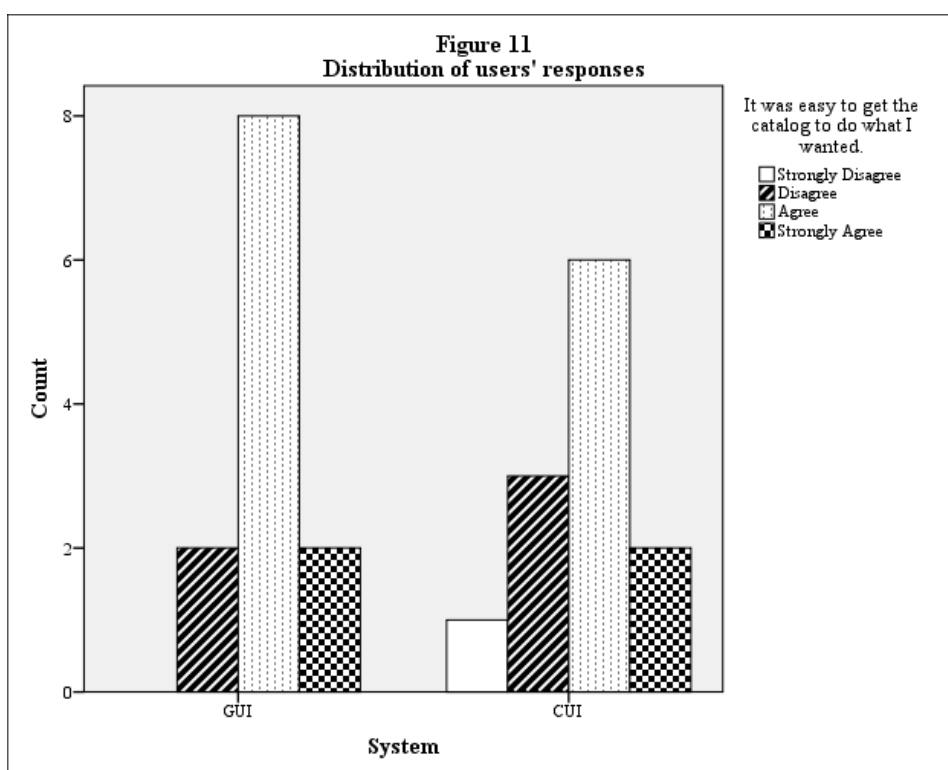


Figure 11: Participants impressions of systems' ease of use.

No significant difference was measured between the ease of use scores and the system used by participants $\chi^2 = (3, N = 12) = 1.49, p = .686$. One user commented that the CUI catalog required too much work to produce results. This comment is intriguing, because it may lend validity to the measure of ease of use utilized in this study. Ease of use is defined as a user's impression of the amount of work or effort a user has to exert to use a system. Another user commented that they felt that the GUI was generally easier to use.

Responses to the clarity of navigation questions were grouped into the "ease of use" category based on the assumption that participants who can clearly navigate an interface will spend less time struggling or working to achieve their goals. When asked if the GUI provided clear navigation choices, 2 or 17% strongly agreed, 8 or 66% agreed, while 2 or 17% disagreed. When asked the same of the CUI, 2 or 17% strongly agreed, 6 or 50% agreed, while 3 or 25% disagreed, and 1 or 8% strongly disagreed. These results mirror the results of the question relating to the OPACs overall ease of use, and are shown in Figure 12. The open ended question area recorded a few more positive comments about the clarity of the CUI's navigation options than about those of the GUI. There were, however, more negative comments concerning the CUI's navigation.

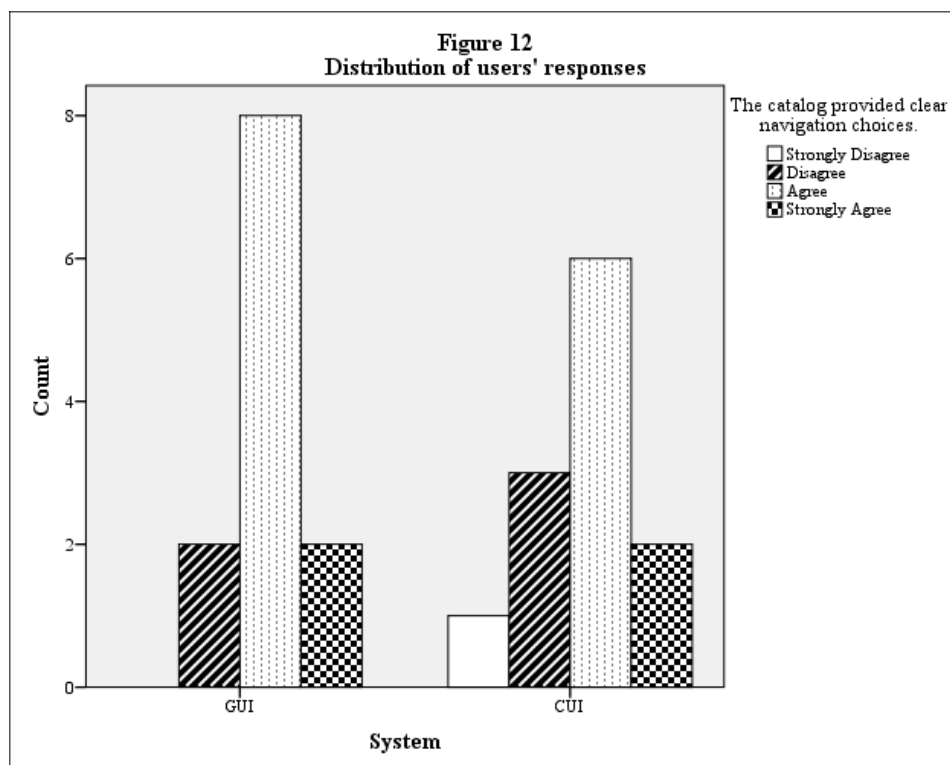


Figure 12: Participants' view of catalogs' clarity

The participants in this study had never used the OPACs before and were essentially new participants at the start of the study. Participants were asked if a new user to the library could use either interface with little or no training. This question provided participants another way they could express their thoughts on the systems' ease of use. This question may not, however, be a reliable measure of participants' perceptions of ease of use as it relies on the assumption that participants see themselves as new participants. When asked whether a new user could use the GUI with little or no training, 2 or 17% strongly agreed, 4 or 33% agreed, while 6 or 50% disagreed. When asked the same of the CUI 5 or 42% agreed, while 2 or 17% disagreed and 5 or 42% strongly disagreed. When looking at these results it is clear that more participants strongly disagreed with the CUI's new user friendliness as seen in Figure 13.

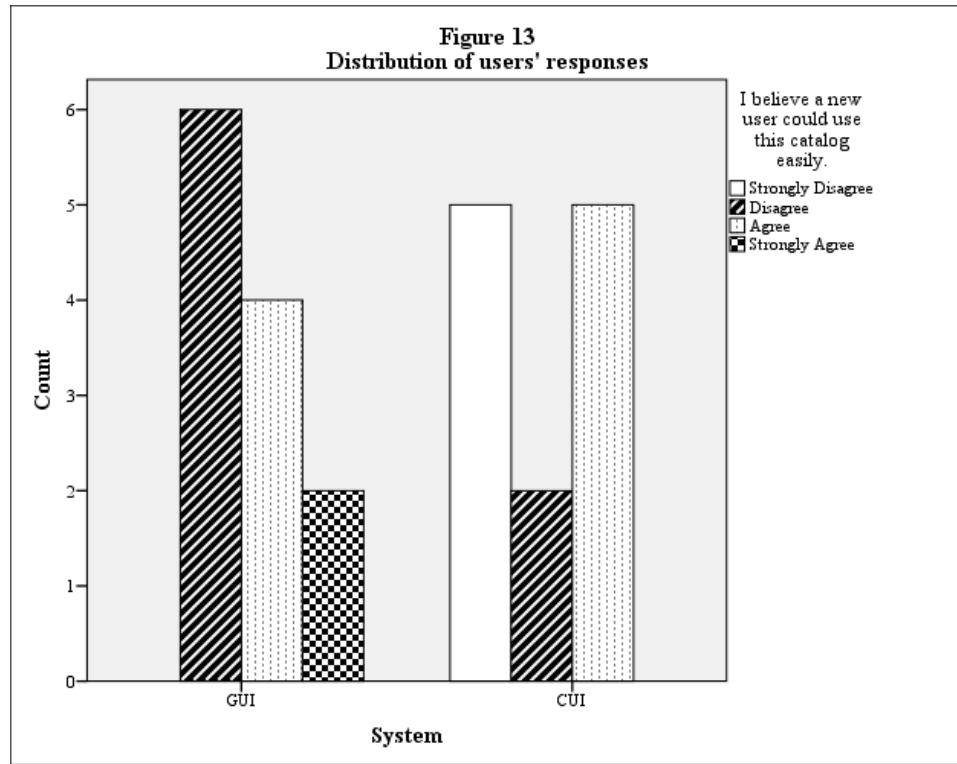


Figure 13: Participants' impression of catalogs' ease of use for a novice

No significant difference was measured between the catalogs' new user friendliness and the system used by participants $\chi^2 (3, N = 12) = 9.11, p = 0.28$. One participant explicitly stated that the GUI interface would be easier to navigate for a novice. After reducing participants responses to a binary measure, it is apparent that the participants were nearly equally split in their opinions that the catalogs would be usable by a new user.

Participants were asked whether they thought that the GUI interface was helpful in assisting participants in searching. 2 or 17% strongly agreed and 50% agreed with the statement, while 4 or 33% disagreed. 2 or 17% strongly agreed, and 4 or 33% agreed that the interface was helpful, while 5 or 42% disagreed and 1 or 8% strongly disagreed.

Participants believed that the GUI was the more helpful of the two OPACs. A tabulation of the data can be found in Figure 14.

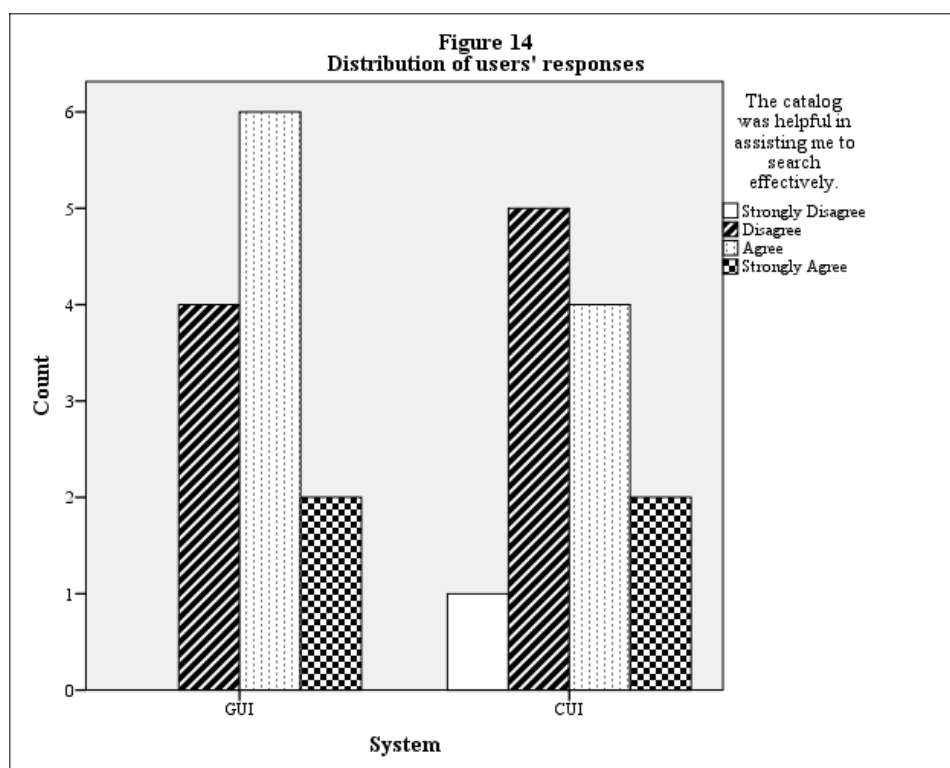


Figure 14: Participants' view of catalogs' helpfulness

No significant difference was measured between participants perception of the catalogs' helpfulness and the system used $\chi^2 = (3, N = 12) = 1.51, p = .68$. One participant wrote the following about the GUI OPAC: "I prefer the terminal because it is more direct and narrow than the web based GUI. When searching on the web based [catalog] it tries to think for you." Another participant commented that the GUI OPAC's ability to search within results was helpful. The CUI received a comment stating that the interface's lack of real time feedback, detracted from its helpfulness.

System Performance

Participants' perceptions of the catalogs' speed was used as the measure of system performance. 2 or 17% strongly agreed and 9 or 75% agreed that the GUI

catalog was fast with only 1 or 8% disagreeing. 2 or 17% strongly agreed and 5 or 42% agreed that the CUI was fast. 4 or 33% disagreed and 1 or 8% strongly disagreed that the CUI was speedy. The total distribution of participants' responses is represented in Figure 15. When grouping the positive responses for each OPAC, 92% of participants thought the GUI OPAC was fast whereas only 59% of participants believed the same of the CUI.

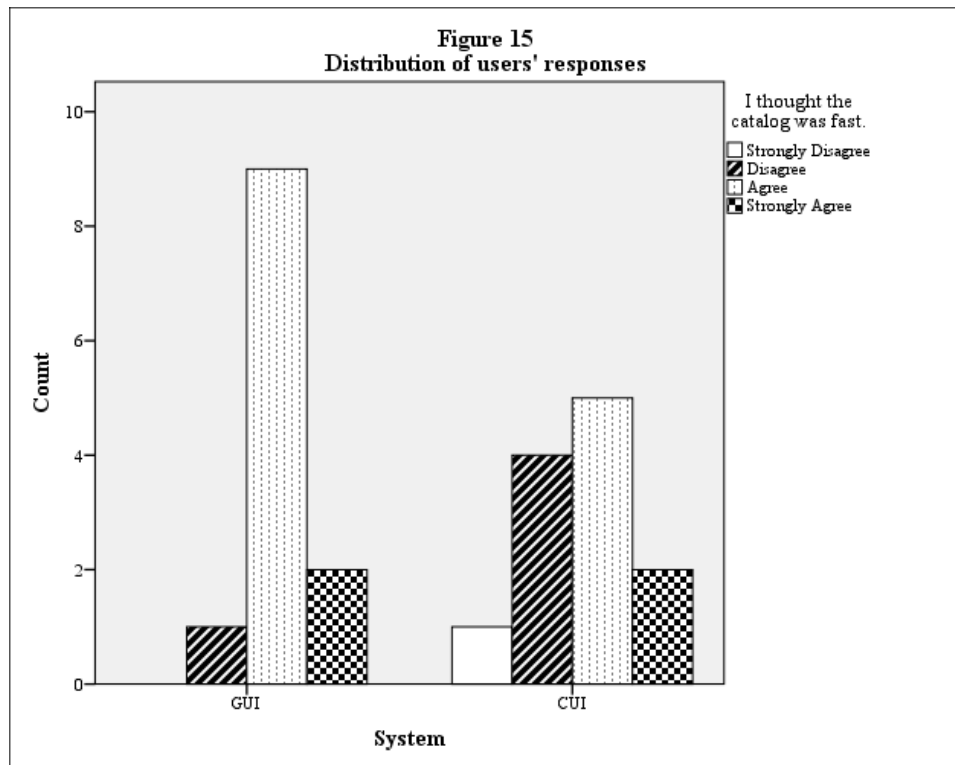


Figure 15: Participants' impression of system speed

No significant difference was measured between speed of the OPAC and the system used by participants, $\chi^2 = (3, N = 12) = 3.94, p = .27$. It is clear from examining the response distribution that the GUI was considered the faster of the two interfaces by participants. One participant reported, "All in all, I think searching was quicker and more efficient on the web interface."

Satisfaction

When asking participants if they were satisfied with their experience with the GUI, 2 or 17% strongly agreed, 6 or 50% agreed, and 4 or 33% disagreed. When asked the same of the CUI, 1 or 8% strongly agreed, 6 or 50% agreed, 4 or 33% disagreed, and 1 or 8% strongly disagreed. Participants believed that the GUI provided a slightly more satisfying experience. An examination of the distribution in Figure 16 reveals that the distribution of the responses was nearly identical.

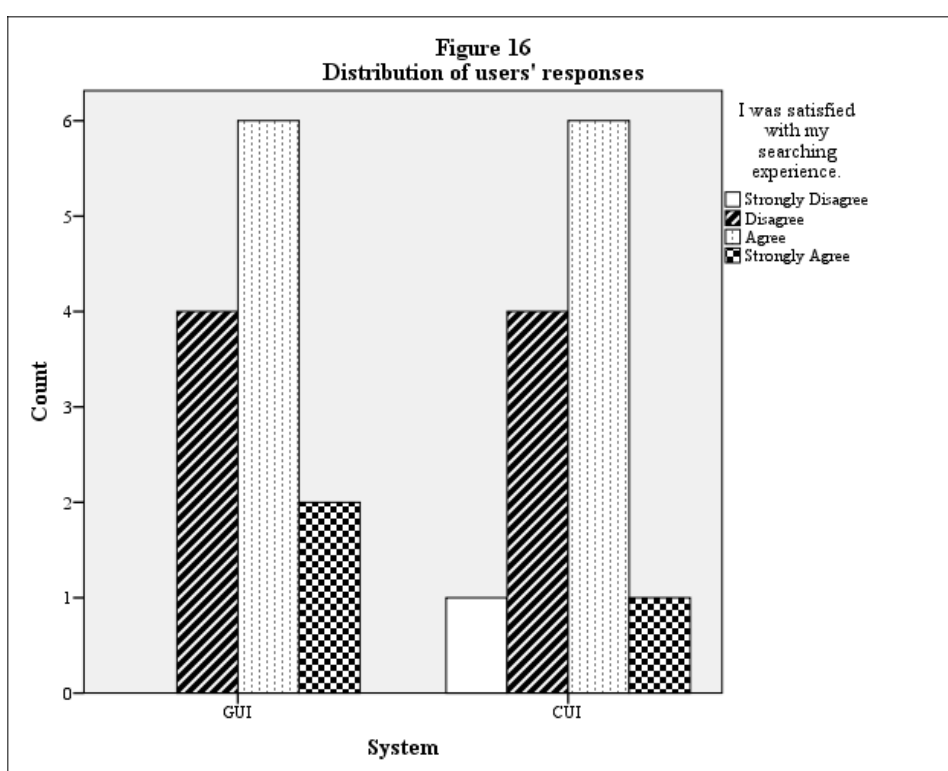


Figure 16: Participants' level of satisfaction with their searching experience

Participants' responses to this question indicated no significant association between participants satisfaction with the catalogs and the system used, $\chi^2 = (3, N = 12) = 1.33, p = 0.721$. One user seemed frustrated with the CUI OPAC's search results when multi-word search strategies were attempted. Only 8% of participants were more satisfied by

the GUI than the CUI. Of participants that were dissatisfied with the interfaces, 8% of participants were more dissatisfied with the CUI than the GUI.

Aesthetics

Participants were asked if they believed that the interfaces were visually appealing. 4 or 33% strongly agreed and 3 or 25% agreed that the GUI was visually pleasing with 5 or 42% disagreeing. 1 or 8% of participants thought that the CUI was visually pleasing while 4 or 33% disagreed and 7 or 58% strongly disagreed with the statement. 11 or 92% of participants believed the CUI to be unattractive. The distribution of responses, as shown in Figure 17, reveals that participants clearly believe the CUI to be the less attractive of the two interfaces.

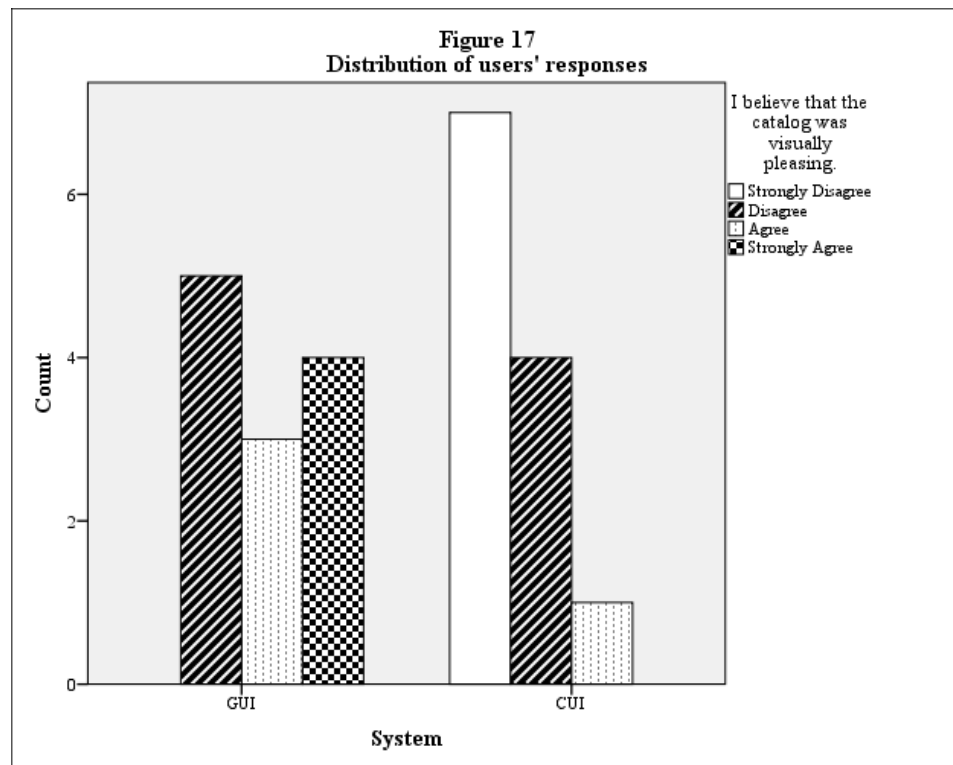


Figure 17: Participants' impression of system aesthetics

A strong statistically significant association was found between the catalogs' visual appeal and the system used by participants, $\chi^2 = (3, N = 12) = 12.11, p = 0.007, \Phi = .71$.

Three participants made references to the CUI OPAC's lack of attractiveness, one saying that they found the CUI OPAC "visually depressing."

Discussion and Limitations

This study is best viewed as groundwork for future studies investigating undergraduates' OPAC UI preferences. The results of this study largely agree with previous research performed by Tomaiulo (1996), Marshal and Zorn (1995 & 1997), and Medeiros's (1999). The majority of the participants preferred to use the GUI interface.

During the analysis of the data, relationships were discovered that suggest that participants' perceptions of system usefulness, aesthetics and ease of use affected participants' overall OPAC preference. The relationship between the aesthetic value of the CUI and participants overall OPAC preference reinforces Kurosu and Kashimura's (1995) findings. In Beheshti's study (1996), participants commented about the visually pleasing nature of the PACE interface, while participants in this study commented about the CUI's lack of aesthetic considerations.

System usefulness in this study was measured in participants' attitudes towards the OPAC's helpfulness. The definition of usefulness is participants' belief that a system will allow them to complete a task. Participants felt that the GUI was the more helpful of the two interface styles. A strong association was found between participants' belief in the GUI's helpfulness and their OPAC preference.

Limitations

This study is limited by the researcher's use of a non-probability based sample. The study was also limited in its restriction to the OPAC preferences of undergraduate university students, individuals eighteen years of age or older. The OPAC preferences of faculty, graduate level students, and other participants groups were not investigated. The tasks performed by the users were artificial; consequently if users were executing searches based on their actual informational needs different results may occur. For example, a user searching for something that they have some vested interest in, or knowledge of, can better analyze their own searching experience to see if the OPAC they are utilizing is meeting their expectations or requirements. The setting in which the study was performed was also artificial. The participants were performing a series of tasks for the researcher; this coupled with the researcher's mere presence could create a level of pressure on the participants that could conceivably alter their perception of their interaction with the OPACs. With the exception of the items related to ease-of-use, more items could have been added to the questionnaire to assess the other constructs of interface performance. From the demographic data gathered, no freshmen students were represented in the sample. All participants in the study were daily computer participants. It may be beneficial in the future to ask participants to quantify the amount of time they spend using computers per week. Additionally, 66% of participants utilized UNC Library's GUI OPAC on at least a weekly basis with 16% reporting daily usage. The reason behind these usage statistics may stem from the fact that almost half of the participants were recruited from a library. Of the participants, only one had previously used the CUI style OPAC, and no participants were given any training with the CUI. Reattempting the study with a larger, random population might yield differing results.

Additionally, providing the participants in future studies with basic training on the CUI interface may produce differing results.

The study has the potential to have a strong validity due to the usage of task lists and questionnaires that revolve around the participants' perceptions of task completion and their opinions about the OPACs. Mutually understood vocabulary and definitions were employed when designing the questionnaire which reduced the likelihood that participants would be confused by the items to which they were responding. This study adapted methodology from previous studies (Hildreth 2001) and its results are similar to those found in other studies which suggest that this study has a high level of repeatability.

Conclusion

This study was intended to determine the user interface preferences of undergraduate students at UNC Chapel Hill. Few studies on the UI preferences of a "net-native" population have been conducted and this study sought to fill a gap in existing research.

The study found that 75% of participants preferred the GUI interface, while only 25% preferred the CUI interface. The study identified that participants' perceptions of a system's ease of use and attractiveness seemed to influence participants overall interface preference.

From the results of this study, it is apparent that user interface developers are likely on the right track when meeting users' needs. Though the majority of users prefer the GUI OPAC interface, it is important to note that 25% of users preferred the CUI

OPAC. User interface designers should attempt to determine what attracts users to the CUI interface and attempt to augment existing GUI systems to meet those users' needs if possible. Users know what they like when they see it, and it seems that users prefer systems that they consider to be easy to use and attractive.

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Appendix A: Task Work Sheets

Task Worksheet A

INSTRUCTIONS:

Please complete the following searches for items only in this catalog. When you find an item that you think fits the task, write its title or call number in the space provided. The call number and title should appear in the item's record. Please complete each task before moving to the next. If you have any general questions, please ask the researcher.

When you finish this task list, the researcher will give you further instruction.

1. Search for two books by the author Stephen King.

Call Number: _____

Call Number: _____

2. Find two books about both Pets and Therapy.

Call Number: _____

Call Number: _____

3. Find a book about Southern Cooking.

Call Number: _____

4. Find the title of a Journal about Information Technology.

Title: _____

5. Find the title of a mystery novel published within the last 5 years.

Title: _____

- If you have just finished your first worksheet, please wait for the researcher to provide the second worksheet.
- If you have finished your second worksheet, please wait for the researcher to provide you the exit questionnaire.

Task Worksheet B**INSTRUCTIONS:**

Please complete the following searches for items only in this catalog. When you find an item that you think fits the task, write its title or call number in the space provided. The call number and title should appear in the item's record. Please complete each task before moving to the next. If you have any general questions, please ask the researcher.

When you finish this task list, the researcher will give you further instruction.

1. Find a juvenile/children's fiction book about Horses.

Call Number: _____

2. Find the title of a Journal about Pediatric Medicine.

Title: _____

3. Find a book that could be used for planning a vacation to Rome.

Call Number: _____

4. Find two books about the reasons for World War I.

Call Number: _____

Call Number: _____

5. Find the earliest book published by author Neil Gaiman.

Title: _____

- If you have just finished your first worksheet, please wait for the researcher to provide the second worksheet.
- If you have finished your second worksheet, please wait for the researcher to provide you the exit questionnaire.

Appendix B: Exit Questionnaire

Please read the following statements and check the answers that best describe your feelings about the Appalachian State University Library's Web Catalog.

1. It was easy to get the web catalog to do what I wanted it to do.

Strongly Disagree
☐

Disagree
☐

Agree
☐

Strongly Agree
☐

2. The web catalog provided clear navigation choices that allowed me to complete my searches.

Strongly Disagree
☐

Disagree
☐

Agree
☐

Strongly Agree
☐

3. The web catalog was helpful in assisting me to search effectively.

Strongly Disagree
☐

Disagree
☐

Agree
☐

Strongly Agree
☐

4. I thought the catalog was fast.

Strongly Disagree
☐

Disagree
☐

Agree
☐

Strongly Agree
☐

5. I believe that someone who is new to the library could use this catalog easily with little or no training.

Strongly Disagree
☐

Disagree
☐

Agree
☐

Strongly Agree
☐

6. I was satisfied with my search experience.

Strongly Disagree
☐

Disagree
☐

Agree
☐

Strongly Agree
☐

7. I believe that the catalog was visually pleasing.

Strongly Disagree
☐

Disagree
☐

Agree
☐

Strongly Agree
☐

8. I would like to use the web catalog again for future searches.

Strongly Disagree

Disagree

Agree

Strongly Agree

☐☐☐☐

Read the following statements and check the answers that best describe your feelings about the Appalachian State University Library's Terminal Catalog.

1. It was easy to get the terminal catalog to do what I wanted it to do.

Strongly Disagree

☐

Disagree

☐

Agree

☐

Strongly Agree

☐

2. The terminal catalog provided clear navigation choices that allowed me to complete my searches.

Strongly Disagree

☐

Disagree

☐

Agree

☐

Strongly Agree

☐

3. The terminal catalog was helpful in assisting me to search effectively.

Strongly Disagree

☐

Disagree

☐

Agree

☐

Strongly Agree

☐

4. I thought the catalog was fast.

Strongly Disagree

☐

Disagree

☐

Agree

☐

Strongly Agree

☐

5. I believe that someone who is new to the library could use this catalog easily with little or no training.

Strongly Disagree

☐

Disagree

☐

Agree

☐

Strongly Agree

☐

6. I was satisfied with my search experience.

Strongly Disagree

☐

Disagree

☐

Agree

☐

Strongly Agree

☐

7. I believe that the catalog was visually pleasing.

Strongly Disagree

☐

Disagree

☐

Agree

☐

Strongly Agree

☐

8. I would like to use the terminal catalog again for future searches.

Strongly Disagree

☐

Disagree

☐

Agree

☐

Strongly Agree

☐

Please answer the following questions about yourself:

1. Your academic year:

Freshman ☐ Sophomore ☐ Junior ☐ Senior ☐ Other ☐

2. How often do you use a computer?

Never ☐ Yearly ☐ Monthly ☐ Weekly ☐ Daily ☐

3. How often do you use the UNC library catalog?

Never ☐ Yearly ☐ Monthly ☐ Weekly ☐ Daily ☐

4. Prior to this experiment, have you used any of the following UNC library catalogs?

(Check all that apply)

Card Catalog ☐ Web Catalog ☐ Text Catalog ☐

5. Now that you've tested both user interface styles, which catalog do you prefer using? (Check only one)

Web/GUI ☐ Terminal/Text ☐

What did you like or dislike about your searching experience? Please share your thoughts.

Thank you for your participation and your contribution to my research!